LETTERS TO THE EDITOR.

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Zeiss Abbe Refractometer.

IN reply to Mr. Simeon's communication published in NATURE of November 21, we would state that of the many different types of Zeiss Abbe refractometer, including a late pre-war instrument, that have passed through our hands for repair, all have been fitted with an illuminating prism of low refractive index glass (N_D about 1·515). In every case, by substituting an extra dense prism of suitable angle, we have rendered the instrument serviceable for the examination of liquids above 1·52. We discovered this defect some time ago, and later directed the attention of Prof. Cheshire to it, communicating it to NATURE of June 21, 1917 (vol. xcix., p. 331). We have a number of these low-refractive index prisms which have been removed from Zeiss refractometers, and also a complete Zeiss instrument showing the defect mentioned. It would, perhaps, be possible to arrange to bring this instrument and the prisms to the next meeting of the Optical Society, and if Mr. Simeon would bring a Zeiss instrument having a pair of extra dense prisms, a comparison would be interesting. It is just possible that the Zeiss instrument to which Mr. Simeon refers is one in which a dense lower prism has been substituted.

As we have already pointed out, in theory any glass would make a suitable illuminating prism so long as the roughened surface remains unimpaired, but in practice the cleaning of the prism surface tends to polish it, and as a result the illumination quickly falls almost to vanishing-point.
L. BELLINGHAM.

Bellingham and Stanley, Ltd.,
71 Hornsey Rise, N.19, November 22.

BRITISH IRON-ORE RESOURCES.

ONE of the most marked effects of the war has been the stimulus that it has given to the development of the mineral resources of the British Empire, and particularly of those of Great Britain. For many reasons the more active exploitation of our home iron ores has been one of the most prominent features of this movement. Up to the invention of the Bessemer process the iron industry of this country depended practically exclusively upon domestic ores, the bulk of the ores smelted being the claybands and blackbands of the Coal Measures; in addition to these the red hæmatites of the Mountain Limestone of the West Coast and some of the Jurassic ironstones were also worked, but up to about 1870 the iron-ore deposits of the Palæozoic rocks formed the mainstay of our British iron industry. When the Bessemer process introduced mild steel as an important factor in the industry, the relatively small production of West Coast hæmatite no longer sufficed for our needs, and as many of our centres of iron-smelting are situated within easy access of the coast, Bessemer ores were naturally looked for abroad, and an energetic importation of foreign ores ensued. Bilbao ore was first imported about 1870, and by 1878, after the Carlist War, this importation had reached 850,000 tons; in 1913 the importation from Spain, to which Almeria and other parts of Spain contributed as well as Bilbao, was 4½ million tons, whilst our total imports from abroad, by far the greater part of which was Bessemer ore, amounted to about 7½ million tons. The domestic ore production was 16 million tons, of which about 12 million tons came from the Jurassic ironstones. The growth in the output of these last-named ores was due in large measure to the increasing adoption of the basic process of steel-making. When the war rendered the importation of foreign ores difficult and expensive, our iron and steel industry had to rely more and more upon basic steel produced from the latter class of ore. This development has been favoured by the grudging recognition that for most purposes basic steel properly made is as good as acid, and furthermore by the abandonment by the Board of Agriculture of the so-called citric acid test for basic slag in favour of its valuation by the total phosphoric acid present; this means that whereas under the former "made in Germany" test thousands of tons of British basic slag had to be dumped out at sea as unsaleable, such slag can now be utilised and its phosphoric acid contents rendered available for the British agriculturist. At the same time, the British steel trade now has a market opened up for what was before a waste product.

One of the signs of the increasing interest taken in domestic ores is the attention that is being devoted to the study of our iron-ore resources. Apart from some earlier descriptions of British iron ores, which have to-day at most only an historical interest, the first attempt at a real estimate of our iron-ore resources was that published by the present writer in the important treatise issued by the Eleventh International Geological Congress at Stockholm in 1910. This showed for the first time the magnitude of Britain's iron-ore reserves, and attracted much attention on the Continent; it would be interesting to speculate how far it may have contributed towards Germany's intention to bring about the war, one of the main motives of which was Germany's desire to obtain possession of the French iron-ore fields and thus to outstrip all competition by commanding far the largest iron-ore supplies of Europe. The principal value of the above-named estimate to-day lies in the fact that it has formed the basis of newer and more accurate estimates. Since the beginning of the war three important contributions to our knowledge of our own iron-ore resources have appeared, each under the auspices of a Government department—it need scarcely be added, having regard to our characteristic British methods, a different department in each case, working independently of the others. Nothing could be more eloquent of the need for a central administration, co-ordinating such efforts and avoiding useless duplication of work. The first was the now well-

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known report on the resources and production of iron ores, etc., by Mr. G. C. Lloyd, issued by the Department of Scientific and Industrial Research, which appeared in May, 1917, a second, revised and enlarged edition being issued towards the end of the same year.

In the spring of this year an important paper was read by Dr. F. H. Hatch before the Iron and Steel Institute by permission of the Controller of Iron and Steel Production, Ministry of Munitions, the data for this having been collected by Dr. Hatch working for that Ministry. It deals with the Jurassic ironstones of the United Kingdom, and, as has already been shown, these constitute by far the most important of the British iron resources from the economic point of view. The deposits dealt with comprise the Northamptonshire, Cleveland, Leicestershire, Oxfordshire, Lincolnshire, and Raasay ironstones, and full descriptions are given of their geology, mode of occurrence, and chemical composition, the numerous tables of analyses being particularly valuable. Finally, Dr. A. Strahan, Director of the Geological Survey, has recently issued his annual report, in which he presents very interesting estimates of the quantity of iron ore that may fairly be assumed to exist in the various deposits. This is a summary of an extensive series of investigations upon British iron-ore deposits which the Geological Survey has been recently conducting, the detailed reports upon which are being awaited with much interest. It constitutes a portion of the very valuable "Special Reports on the Mineral Resources of Great Britain," the first volume of which was issued in November, 1915; in the introduction to this volume Dr. Strahan has set out clearly the object of these reports and their economic significance.

The present report summarises as follows the iron-ore resources of Great Britain under two heads: (*a*) reserves more or less developed, and (*b*) probable additional reserves. The figures are:—

	(*a*)	(*b*)
Hæmatites, etc. ...	42,500,000 tons	75,000,000 tons
Mesozoic ores ...	1,775,052,160 ,,	2,104,886,000 ,,
Clay-ironstones and blackbands ...	1,065,637,000 ,,	6,248,475,600 ,,

Dr. Strahan says that the estimates are "framed in a cautious spirit," and this statement may readily be accepted. Indeed, as regards the last class, the figures are palpably under-estimated; thus the probable additional reserves are given as about 6250 million tons, of which four-fifths are credited to South Wales and Monmouthshire, the coalfield which Dr. Strahan probably knows best. There is no reason to suppose that the other British coalfields fall so far short of South Wales in iron contents as collectively to contribute only one-fifth of the whole, and in some cases the figures are clearly wrong. For instance, for the whole of the great northern coalfield he gives only 1·5 million tons, apparently taking the Redesdale area alone, whilst Durham is not even mentioned. Yet such ironstones were worked extensively at Shotley Bridge and other places in the Derwent Valley, as well as at Waldridge Fell, Urpeth, Birtley, Tow Law, and other points in the county of Durham, whilst in Northumberland they were worked at Wylam and Lemington in the extreme south of the county, and at places so far apart as Haltwhistle, Hareshaw, Redesdale, and Brinkburn. There is no evidence whatever that the ironstone was worked out at any of these places, but quite the contrary, and there is at least a probability that it underlies the entire coalfield, though whether it will ever prove to be workable is another question; Dr. Strahan, however, points out that he is "concerned only with the quantities that exist," quite apart from their workability. It must indeed be admitted that this part of the question is one of scientific rather than of economic interest, and in any case the full reports are not yet available, though it is to be hoped that they soon will be. All contributions to our knowledge of our own mineral resources are of the greatest value to the nation at the present time.

H. LOUIS.

TROPICAL QUEENSLAND.[1]

THE author does well to remind us that much of Queensland is tropical, and that it possesses the largest barrier reef in the world, enclosing a lagoon of immense size and possibly of great potential wealth in pearls, pearl-shell, bêche-de-mer (trepang), fish, and perhaps some day sponges as well. Here, on Hinchinbrook, a coastal island made known to us by his "Confessions of a Beachcomber," the author ruminates on the birds, beasts, and plants around him, a true beachcomber far from and almost uninterested in the world's affairs, content to bask in the suns of his Arcady. All is delightful; the greatest men of the past are those born in the lands of the sun; the planter tills not, but "permits Nature to have her own wayward will with his dutiful trees"; "vegetation does not tolerate any period of rest," and here are "many lusty, fat, sleek, good-humoured, straight-backed, frolicsome calves." It is impossible to criticise from the point of view of science, since the author's writing partakes of the Arcadian nature of his pursuits. The power of observation of, and a feeling for, the important facts of life in all living Nature the author certainly has, but we have the uneasy feeling that he has set out to write a book, whereas in his "Confessions" he poured out his soul and gave us a book of permanent value. "Tropic Days" is, however, thoroughly pleasant chat, well fitted for one's lighter hours, and as such likely to appeal to a wide circle of readers.

Descriptions of trees and plants are always excellent, and a charming individuality is given to certain trees of the domain. A chapter on beach plants reveals in this environment practically the same types of growths and plants as are found in

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[1] "Tropic Days." By E. J. Banfield. Pp. 313. (London: T. Fisher Unwin, Ltd., 1918.) Price 16*s*. net.

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